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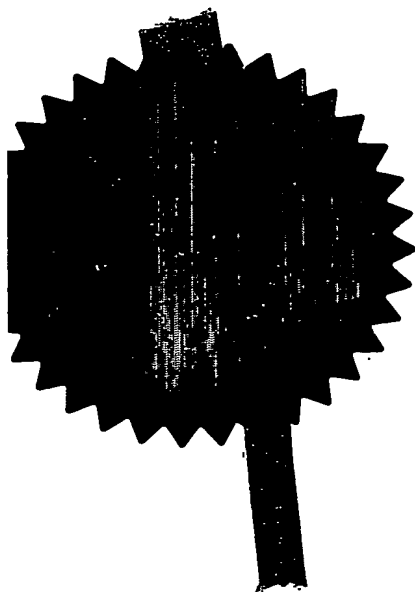
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13 JUN 2002

1. Your reference

A1439

2. Patent application number

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0213601.8

3. Full name, address and postcode of the or of each applicant (underline all surnames)

LEVINSON; Orde
Caudwell's Castle
Folly Bridge
Oxford OX1 4LB

Patents ADP number (if you know it)

7400989002

If the applicant is a corporate body, give the country/state of its incorporation

4. Title of the invention

A Urine Sample Collection Device

5. Name of your agent (if you have one)

"Address for service" in the United Kingdom to which all correspondence should be sent (including the postcode)

ABLETT & STEBBING
CAPARO HOUSE
101-103 BAKER STREET
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W1U 6FQ

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00006551001

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Country

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Number of earlier application

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13 June 2002

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G K ABLETT / S J SUER (0207-935-7720)

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A URINE SAMPLE COLLECTION DEVICE

The present invention relates to a urine sample collection device.

5 The Applicant is the proprietor of earlier patent application WO-A-01/74275. This application details the various reasons why urine samples are collected, and the uses for the results of the analysis of the collected sample.

Figure 1 illustrates a urine sample collection device 1
10 based on the disclosure of this earlier patent application. The device has a urine receptor generally identified by reference numeral 2. This comprises a surface 7 which defines at one end an outlet aperture 3 and which flares out to define at its other end a rim 8 forming a perimeter of an inlet area
15 into which a user urinates. The various forms of the receptor are described in more detail in the aforementioned patent application. The outlet aperture is coupled to one end of a generally elongate hollow tubular member or pipe portion 4. The other end of the tubular member is open. The tubular
20 member 4 narrows along its length and the end remote from the outlet aperture 3 defines a generally oblong excess outlet aperture 6. A sample container coupling 5 comprises a short hollow stub like tube which is formed with a passage therethrough which meets an opening in the centre of the side
25 of the tubular member. The sample container coupling 5 is located along the tubular member 4 to be spaced from the outlet aperture 3. The sample container coupling is formed to provide a push fit for a standard urine sample collection container or bottle (not shown). The sample container coupling
30 5 is located and formed such that the sample container is orientated vertically downwards during use.

In use, a standard tubular urine sample collection container (not shown) is pushed onto the sample container

coupling 5. A female user then locates the receptor 2 against their body to cover the urethra as explained more fully in the aforementioned patent application. A male user locates the end of their penis into the receptor.

5 The user then urinates and urine flows along the tubular member and flows both into the urine sample collection container and out of the excess outlet aperture 6. Once the collection container is full, the user can simply finish urinating because excess urine flows out of the excess outlet
10 6. Alternatively, the user can withdraw the device 1 and continue to urinate, but this increases the likelihood of contamination to their hands.

 In this type of device, the urine flows through the device and out of the excess outlet aperture with a proportion
15 of that urine flow being collected in the collection container via sample container coupling 5. This through flow type of device differs from devices where all the urine flow is directed straight into a collection container.

 However, filling the urine collection container to
20 capacity can cause problems. For example, uncoupling the full collection container from the collection device without spillage may be problematic.

 It is an object of the present invention to provide an improved urine sample collection device.

25 According to the present invention there is provided a urine sample collection device comprising:-

 a urine receptor having a surface which flares out from an outlet aperture to a rim defining a perimeter of an inlet area into which a user urinates;

30 a generally elongate tubular member extending from said receptor outlet aperture to an open end, the tubular member having an opening formed in the side thereof;

 a coupling means for releasably mounting a urine

collection container, the coupling means having a first passage extending therethrough which meets said opening whereby urine can flow from the tubular member into a mounted container; and

5 a flow limiter, or urine collection container having a flow limiter, for limiting flow of urine into the container.

The flow limiter preferably allows urine to enter a container to a predetermined limit, after which further urine is prevented from entering the container. In this way, the
10 amount of urine entering the container cannot exceed a predetermined maximum, for example beyond a fraction (e.g. from 50 to 75%) of the capacity of the container.

The flow limiter may limit flow of urine into the container by preventing ingress of urine, or by preventing
15 egress of displaced air from the container. For example, the flow limiter may prevent ingress of urine into the container by means of a valve between the opening and a container in use, which valve closes when the urine in the container reaches a predetermined level. Alternatively, the device may
20 comprise a passage, for example between the container and the tubular member, through which air displaced from the container by ingress of urine can escape from the container, whereby urine is prevented from entering the container by the urine level rising to cover the container-side opening of the
25 passage. In this way, further urine is prevented from entering the container by preventing air from being displaced from the container.

In a preferred embodiment of the present invention, the passage of the coupling means comprises first and second
30 passages extending into the tubular member, the first passage presenting an area within the tubular member into which urine can enter and flow into a collection container, and the second passage presenting an area from which air in the collection

container can escape into the tubular member, the second passage extending into the tubular member by an amount which is greater than the first passage. In use, the first and second passages extend into the container, which is fitted to
5 the device such that substantially all fluid transfer between the tubular member and the container occurs via the first and second passages, in particular transfer of urine from the tubular member to the container via the first passage and transfer of air from the container to the tubular member via
10 the second passage. Thus, as urine enters the container via the first passage air is displaced into the tubular member via the second passage. However, when the level of urine in the container rises to cover the container-side opening of the second passage, no further air can be displaced from the
15 container into the tubular member, and hence no further urine can enter the container. The amount of urine which can enter the container is thus largely determined in this embodiment by the extent to which the second passage extends into the container.

20 In another preferred embodiment of the present invention, the flow limiter comprises a valve through which urine can flow from the tubular member into a container. For example, the valve may comprise a lower opening through which urine can pass into the container, an upper opening through which urine
25 can enter the valve from the tubular member, and a closure member positioned between the upper and lower openings, and dimensioned so as to be capable of closing the upper opening. In this embodiment, the closure member may conveniently have a density lower than that of urine, i.e. it will float in
30 urine, so that as the level of urine in the container rises to reach the closure member it will float upon the urine. Thus, the closure member will rise with the urine, until it reaches the upper opening to form a seal therewith, thus

preventing further urine from entering the container. Once the upper opening has been sealed in this way, as the user continues to urinate, further urine will merely pass through the tubular member from the device.

5 A view has been expressed by medical personnel that it is important to sample the urine mid stream. One justification for obtaining a mid stream urine (MSU) sample is that if there is any initial contamination in or around the urinary tract or urethra, such contamination will be flushed out at the
10 start of urination. Another justification is that a mid stream sample is more representative of the contents of the bladder than that at the start of urination and is less dependent on personal hygiene..

In this case, if an MSU sample is to be obtained, it is
15 important not to collect the initial flow at the start of urination and immediately thereafter. Unfortunately, with the device shown in figure 1, it is not possible to guarantee that a proportion of this initial flow will not be collected.

The device of the present invention therefore preferably
20 further comprises a flow director located at or adjacent said opening and formed to direct urine past the opening.

Preferably the flow director comprises a projection towards the axis of the tubular member.

In one embodiment, the projection is provided upstream
25 of the opening.

In another embodiment, the projection is also formed downstream of the opening.

In one preferred embodiment, the projection upstream of the opening has an inclined surface.

30 In another preferred embodiment, the projection upstream of the opening comprises a wall which extends across the tubular member to an extent corresponding to the upstream edge of said opening.

Conveniently, the flow director is formed to channel the urine flow along either side of the aperture.

As referred to above, in a preferred embodiment of the present invention, the projection towards the axis of the 5 tubular member may comprise the first passage of the coupling means, the passage extending into the tubular member and presenting an area within the tubular member into which urine can enter and flow into the collection container. More preferably, the passage of the coupling means extends into the 10 tubular member by an amount corresponding to between 20 and 60% of the height of the tubular member. The area preferably comprises a semi-circle, and the extension of the passage into the tubular member is greater downstream than upstream. The coupling means preferably includes a second passage extending 15 therethrough which meets said opening to present an area from which air in the collection container can escape into the tubular member. The second passage of the coupling means preferably extends into the tubular member by an amount which is greater than the first passage.

20 It is preferred that the tubular member tapers to a smaller cross-section at said open end.

Examples of the invention will now be described with reference to the following figures, in which:-

Figure 1 shows an oblique perspective view of a known 25 urine sample collection device;

Figure 2 shows a perspective side view of a tubular member part of an embodiment of the present invention;

Figure 3 shows the cross-sectional views along the line C-C of figure 2;

30 Figure 4 shows the cross-section along the line D-D of figure 2;

Figure 5 illustrates a side view of a receptor, tubular member and coupling means parts of another embodiment of the

present invention;

Figure 6 illustrates a plan view of the urine receiving portion of figure 5 as viewed along the axis of the tubular member;

5 Figure 7 illustrates a cross-sectional side view taken along the length of the tubular member part of figure 5 omitting the urine receptor.

Figure 8 illustrates a flow limiter for use with the urine sample collection devices shown in the previous Figures;

10 Figure 9 illustrates a further flow limiter for use with the urine sample collection devices shown in Figures 1 to 7; and

Figure 10 illustrates a further flow limiter for use with the urine sample collection devices shown in Figures 1 to 7.

15 Component parts which are common amongst the figures bear common reference numerals.

It is considered that if a through flow type of device as shown in figure 1 is to obtain a mid stream urine sample, it is necessary to ensure that as little as possible of the
20 initial urine flows into the collection container. It is considered that proportion of urine entering the collection container, at least during the initial flow, will be a function of the area of the opening to the passage through the sample container coupling 5, that is to say, the opening of
25 the passage onto the tubular portion 4, and the velocity (and hence momentum) of the urine flow upstream of the coupling. The former can be designed whilst the latter will be influenced by the bladder of the user and by gravity consequent to the angle of the urine flow in the tubular
30 portion relative to vertical.

One option to reduce the proportion of urine entering the collection container during the initial flow would be to make the aforementioned area smaller and/or increase the velocity

of the urine flow. Unfortunately, this tends to lead to problems with the overall urine collection to the point that the collection container remains substantially empty.

Figure 2 illustrates an oblique perspective view of a portion of a tubular member 4' corresponding to the tubular member 4 shown in figure 1. The precise form of the receptor is not material to the present invention. In this embodiment, the tubular member has a generally square cross section as shown in the drawings but is not limited thereto. The tubular member has a base 20 from which a sample container coupling 5' extends. The sample container coupling 5' has a passage therethrough which meets an opening formed in the base of the tubular member 4', the opening defining a planar area 21. Thus, urine flowing down the tubular member 4' can pass down into a collection container (not shown) fitted to the coupling 5'. The flow of urine in the tubular member 4' is indicated by an arrow U, substantially along the axis of the tubular member.

In this embodiment, the base 20A which is upstream of the area 21 is formed to include an inclined surface or ramp 24 which leads up to the area 21. The ramp therefore projects towards the axis of the tubular member. The area 21 is substantially parallel to the surface of upstream base 20A but is not in the same plane. Downstream of the area 21, the central member of the base of the tubular member 4' along the axis thereof defines a plateau surface 22 which is on the plane defined by the area 21. Towards either edge of this plateau surface, channels 23 are formed which extend either side of the area 21 to meet the base 20 which is upstream of the area 21. The base of the channels 23 is on the plane of the base 20 which is upstream of the area 21.

Thus, when urination starts, if the urine is flowing slowly, urine will flow along the channels 23 and pass either

side of the area 21 so that none of this initial flow will pass into the collection container through the area 21. As the urine flow builds up in velocity, it will tend to rise up the ramp 24. Eventually, the urine will tend to travel entirely 5 up the ramp and will be directed over the area 21. However, due to the velocity, the urine will tend not to fall onto the area but instead pass completely over it so that none of this flow will pass into the collection container through the area 21. Consequently, the channels and ramp 24 function to direct 10 the flow of urine past the area 21.

Generally speaking, the volume of urine entering the tubular member 4' will eventually be greater than that leaving through the aperture 6. Thus, a front of fluid begins to "back up" along the tubular member. When the front reaches the area 15 21, the collection container will begin to fill. Thus, the early part of the urine flow does not pass into the collection container so that an MSU sample is collected.

Consequently, by having a ramp 24 to direct the urine to pass over the area 21 facilitates the collection of an MSU 20 sample. In addition, by having the channels 23, if the initial urine flow is very slow, for example due to urological diseases or infections which can cause pain or for those with voiding difficulties or obstructions, this slow moving urine is directed either side of the area 21 and is not collected. 25 In addition, in cases where imperfect personal hygiene tends to contamination the early part of a urine sample, this contaminated part of the urine flow is not collected.

The present invention is capable of considerable modification, the detailed embodiments of which will be 30 readily apparent to those skilled in the art. For example, whilst the present embodiment has been described to include channels 23, these can be omitted such that the ramp 24 extends across the width of the base 20 if very slow urine

flow is not to be considered a problem during urine collection. It will be appreciated that the angle and size of ramp can be varied. Whilst a ramp has been described as the flow director, a wall can be used which extends across the base 24 to an extent corresponding to the upstream edge of the area 21 such that the area is masked from the direct flow of urine along the tubular member 4'. The wall can also be V-shaped pointing upstream so that slow moving urine is directed around the area 21. Alternatively, the coupling 5' can be made such that it extends through the base 20 whereby its upper edge defines the area 21 which is in a plane located displaced relative to the base 20.

In this respect, referring to the urine sample collection device 1'' shown in figures 5 to 7, the urine receptor 2'' is substantially identical to that shown in figures 1 to 4. However, it will be noted that the device has a tubular member 4'' which comprises a constant circular cross-section tube, that is to say, it does not narrow between the urine receptor 2'' and the excess outlet aperture 6''.

A sample container coupling 5'' is located as with figures 1 to 4. As can be seen from figures 6 and 7, the outer surface of the coupling 5'' has a portion 10 at the end onto which a sample container can be attached, this portion having a circular cross-section outer surface. The outer surface of the coupling 5'' also has a portion 12 where the coupling meets the tubular member 4''. The portion 12 has a larger circumference than the portion 10, the portions 10 and 12 meeting at an elbow 11.

A passage is formed through the coupling 5'' which comprises a circular cross-section tube which is split into first and second separate channels 13 and 14 having respective semi-circular cross-sections, as can be seen from figure 6. One end (the lower end) of the channels 13 and 14 extend

equally from the lower edge of the portion 10, as can be seen from figure 7. The other end (the upper end) of the channels 13 and 14 extend through the base of and into the tubular member 4''. The upper edge of the channel 14 extends further 5 into the tubular member 4'' than the channel 13 and is located on the side towards the outlet aperture 6'' (downstream). The upper edge of the channel 13 defines a semi-circular area 21'' whilst the upper edge of the channel 14 defines a semi-circular area 15.

10 When urination starts, if the urine is flowing slowly, urine will flow down the tubular member 4'' and will flow either side of the channels 13 and 14 extending into the member 4''. Thus, none of this initial flow will pass into a collection container. As the urine flow builds up in velocity, 15 the flow in the tubular member 4'' will become deeper until the depth reaches a value of "a", which comprises the distance (the height) of the upstream edge of the channel 13 from the base of the tubular member 4'', as shown in figure 7. At this point, urine will start to flow into the area 21'' and down 20 through the channel 13 into the collection container. The downstream channel 14 acts as an air vent for air to escape from the collection container as it fills. The upper edge 15 has a height from the base of the tubular member 4'' which is greater than "a" so that urine does not normally flow down 25 channel 14. The height "a" is preferably in the range of 20 to 60% of the height of the tubular member 4'' at the point of the coupling 5''. In this case, the tubular member has a diameter "d" and hence $a = 20-60\%$ of d . Thus, the area 21'' is effectively spaced from the base or lower surface of the 30 tubular member 4'' by an a distance which provides a wall against slow flowing urine.

It will be apparent that an air vent for the collection container can be provided in a different manner.

The present invention may be produced from a plastics material injected into a tool having a shaped insert to form the tubular member 4'. In the described embodiment of figures 2 to 4, the tubular insert can be a single piece that is withdrawn in the direction of the receptor 2. If a two piece insert is used, it is possible to have the area 21 made such that it is in the plane of the base 20 but the top edge of the ramp 24 remains displaced from the plane of the base.

By having a construction as shown in the embodiment of figures 5 to 7 and with a tubular member 4'' which does not narrow, it is possible to produce a tool in which a shaped insert can form the tubular member 4'' by insertion into opposing ends thereof.

Referring to Figure 8, a flow limiter for use with the urine collection devices illustrated in the previous Figures comprises a valve 100 for preventing ingress of urine into a container 122. The valve 100 is positioned within the first channel 13, described with reference to Figures 5 to 7, with corresponding second channel 14 for escape of displaced air into the tubular member (not shown in Figure 8). The valve 100 comprises an upper opening 102, a lower opening 104 and a closure member in the form of a ball 106. The ball 106 has an overall density lower than that of urine, and will thus float on urine, and is initially maintained in position away from the lower opening 104 by an internal wall 108 so as not to block the lower opening 104. The diameter of the ball 106 is greater than that of the upper opening 102. In use, urine will enter the valve 100 from the tubular member as indicated by arrow A, passing through and out of the valve 100 as indicated by arrow A' into the container 122. The urine level in the container 122 will rise, and after a time will enter the valve 100 via lower opening 104. As the urine level continues to rise within the valve 100, the ball 106 will

float on the urine, until it reaches the upper opening 102, i.e. urine will rise within the container 122 to the level approximately indicated by arrows B in Figure 8. The ball 106 will then close the upper opening 102, thus preventing further urine from entering the valve 100, and hence the container 122. As the user continues to urinate, further urine cannot pass through the valve 100 into the container 122, but merely passes through and from the tubular member. Of course, urine will be present within the first channel 13 above the valve 100 between the tubular member and the valve 100, which urine will drop into the container 122 when the ball 106 drops from the upper opening 102 as the container 122 is removed from the device. The total amount of urine to be collected can thus be predetermined from the position of the valve 100 within the container 122 in use, and the capacity of the first channel 13 between the tubular member and the valve 100. Urine spillage on removal of the container 122 from the device can be substantially prevented by ensuring that the capacity of the container 122 above the level of the valve 100 in use is greater than the capacity of the first channel 13 between the tubular member and the valve 100.

Referring to Figure 9, a further flow limiter is illustrated which comprises first and second channels 13 and 14, described with reference to Figures 5 to 7. The second channel 14 extends into the container 122 by an amount which is greater than the first channel 13. The container 122 forms a fluid tight seal with the coupling 105, i.e. urine can enter the container 122 only through first channel 13 and displaced air can only escape from the container 122 through second channel 14. Thus, as described hereinabove with reference to Figures 5 to 7, in use urine passes into the container 122 from the tubular member (not shown in Figure 9) via channel 13, as indicated by arrow A", and displaced air passes out of

the container 122 via channel 14, as indicated by arrow C. As the urine level within the container 122 rises it will after a time reach the level of the lower opening of channel 14, as approximately indicated in Figure 9 by arrows D. At this point, no further air can be displaced from the container 120, and hence no further urine can enter the container 120. Thus, all further urine will pass through the tubular member from the urine collection device. Of course, urine will be present within the first channel 13, which urine will drop into the container 122 when it is removed from the device, i.e. when the fluid tight seal between the container 122 and the coupling 105 is broken and air can escape. The total amount of urine to be collected can thus be predetermined from the position of the lower opening of the second channel 14 within the container 122 in use, and the capacity of the first channel 13. Urine spillage on removal of the container 122 from the device can be substantially prevented by ensuring that the capacity of the container 122 above the level of the lower opening of the second channel 14 in use is greater than the capacity of the first channel 13.

A further flow limiter for use with the urine sample collection devices shown in Figures 1 to 7 is illustrated in Figure 10. This flow limiter is substantially identical to that shown in Figure 9 with the exception that the coupling 115 is hollow, and the first and second channels 13 and 14 respectively passing therethrough are contiguous.

It is to be noted that although the flow limiters shown in Figures 8, 9 and 10 are described with specific reference to the urine collection device shown in Figures 5 to 7, they may be used equally with other urine collection devices, as will be apparent to those skilled in the art.

CLAIMS

1. A urine sample collection device which comprises:-
a urine receptor having a surface which flares out from
5 an outlet aperture to a rim defining a perimeter of an inlet
area into which a user urinates;
a generally elongate tubular member extending from said
receptor outlet aperture to an open end, the tubular member
having an opening formed in the side thereof;
10 a coupling means for releasably mounting a urine
collection container, the coupling means having a first
passage extending therethrough which meets said opening
whereby urine can flow from the tubular member into a mounted
container; and
15 a flow limiter, or urine collection container having a
flow limiter, for limiting flow of urine into the container.
2. A device according to claim 1 wherein the flow
limiter allows urine to enter a container to a predetermined
limit, after which further urine is prevented from entering
20 the container.
3. A device according to claim 1 or 2 wherein the flow
limiter comprises a valve between the opening and a container
in use, which valve closes when the urine in the container
reaches a predetermined level.
- 25 4. A device according claim 1, 2 or 3 wherein the flow
limiter comprises a valve through which urine can flow from
the tubular member into a container, the valve comprising a
lower opening through which urine can pass into the container,
an upper opening through which urine can enter the valve from
30 the tubular member, and a closure member positioned between
the upper and lower openings, and dimensioned so as to be
capable of closing the upper opening.

5. A device according to claim 4 wherein the closure member has a density lower than that of urine.

6. A device according to claim 4 or 5 wherein the closure member comprises a ball.

5 7. A device according to any preceding claim wherein the flow director comprises a projection towards the axis of the tubular member.

8. A device according to claim 7 wherein the projection is provided upstream of the opening.

10 9. A device according to claim 8 wherein the projection is also formed downstream of the opening.

10. A device according to claim 8 or 9 wherein the projection upstream of the opening has an inclined surface.

11. A device according to claim 8 or 9 wherein the
15 projection upstream of the opening comprises a wall which extends across the tubular member to an extent corresponding to the upstream edge of said opening.

12. A device according to any preceding claim wherein the flow director is formed to channel the urine flow along
20 either side of the aperture.

13. A device according to claim 7 wherein the projection towards the axis of the tubular member comprises the first passage of the coupling means, the first passage extending into the tubular member and presenting an area within the
25 tubular member into which urine can enter and flow into the collection container.

14. A device according to claim 13 wherein the first passage of the coupling means extends into the tubular member by an amount corresponding to between 20 and 60% of the height
30 of the tubular member.

15. A device according to claim 13 or 14 wherein the area comprises a semi-circle and wherein the extension of the first passage into the tubular member is greater downstream

than upstream.

16. A device according to any one of claims 13 to 15 wherein the coupling means further includes a second passage extending therethrough which meets said opening to present an area from which air in the collection container can escape into the tubular member.

17. A device according to claim 16 wherein the second passage of the coupling means extends into the tubular member by an amount which is greater than the first passage.

10 19. A device according to any preceding claim wherein the tubular member tapers to a smaller cross-section at said open end.

20. A urine sample collection device substantially as herein described with reference to the accompanying drawings.

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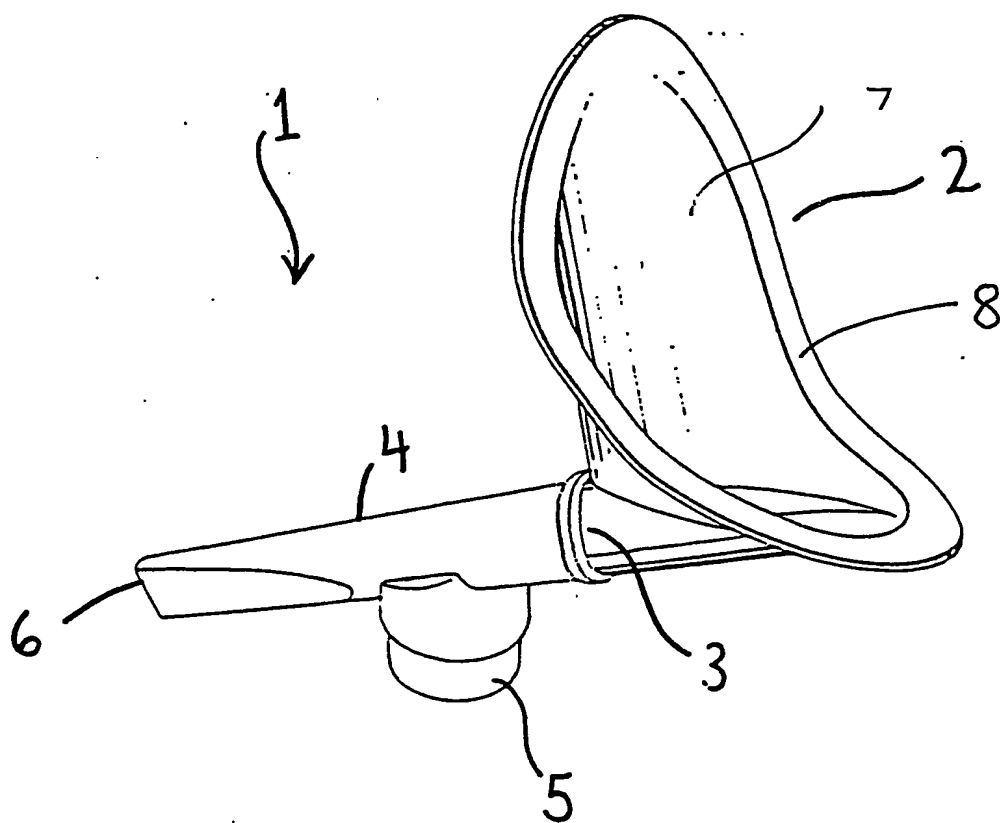
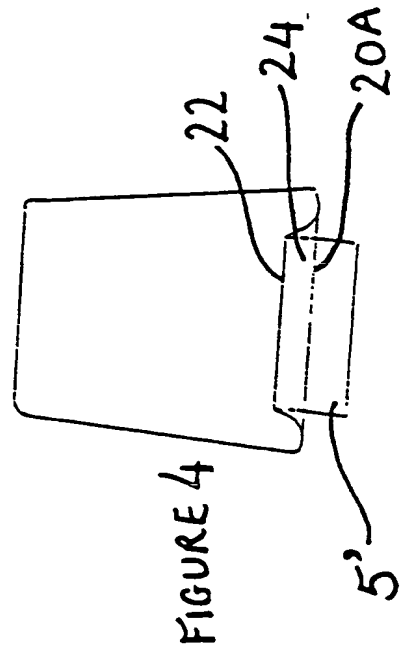
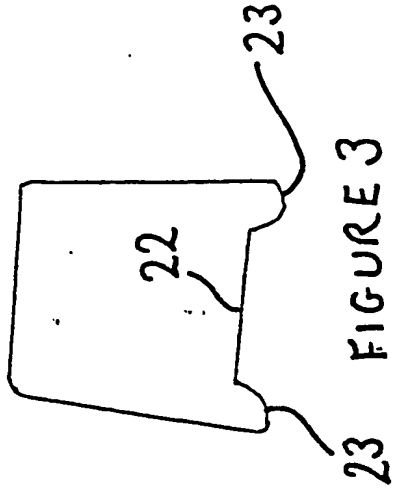
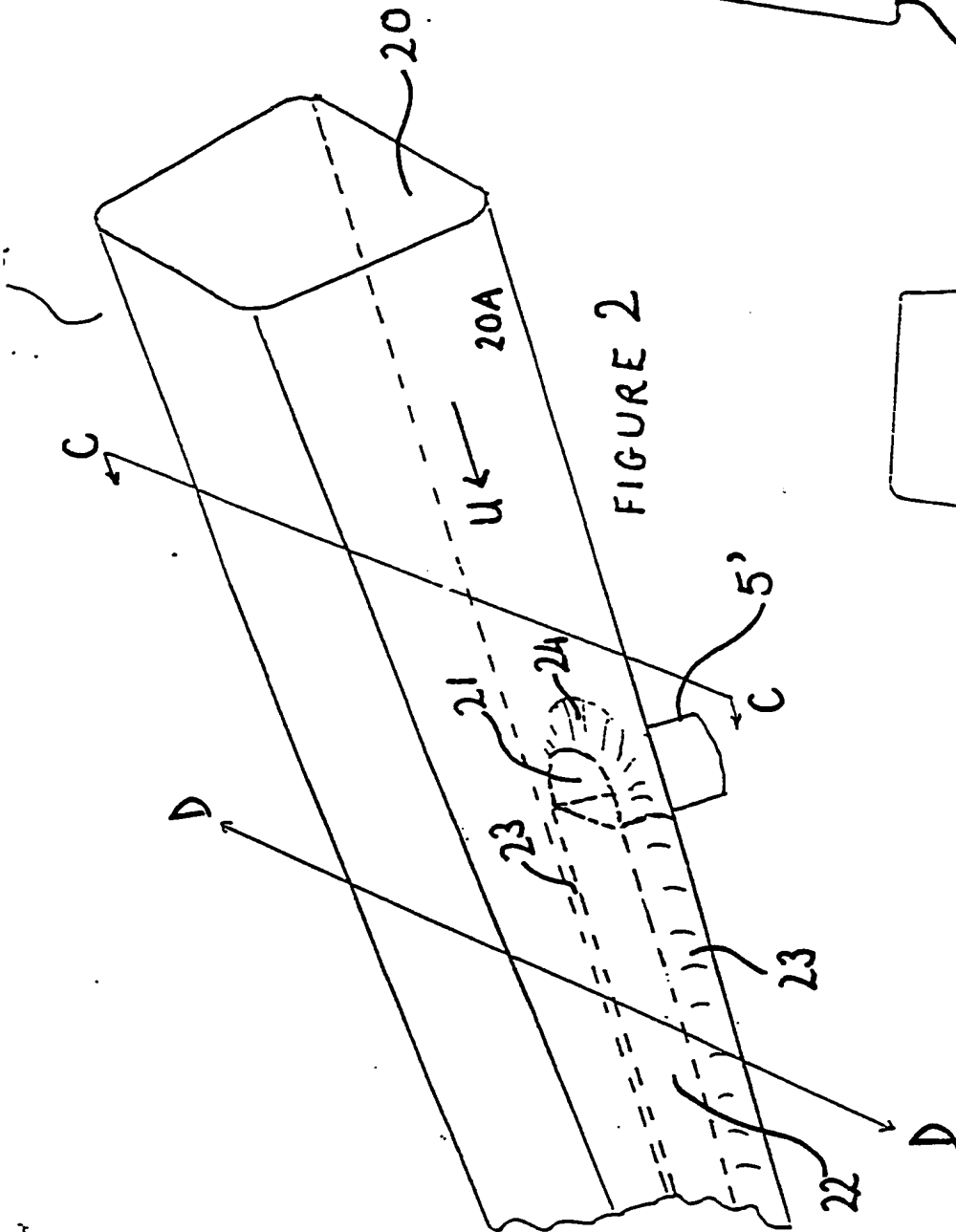


FIGURE 1



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1"

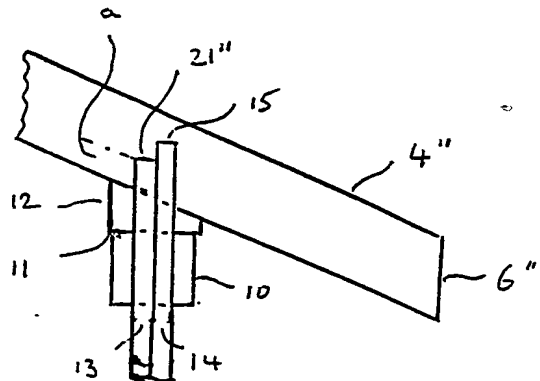
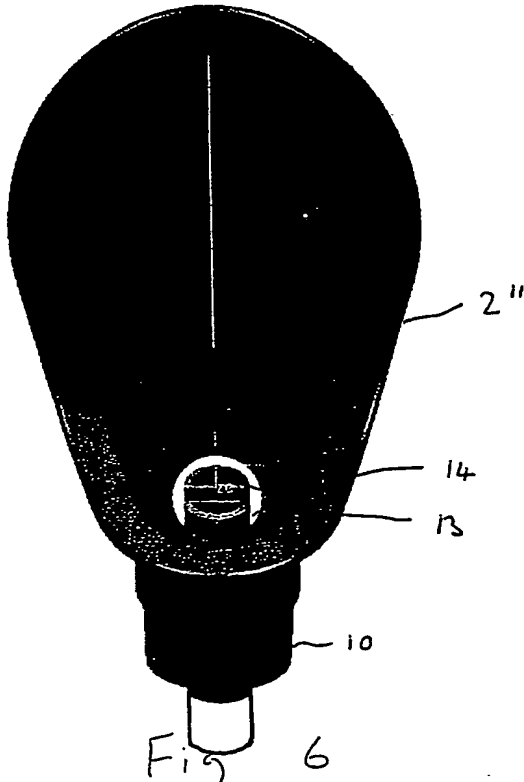
2"

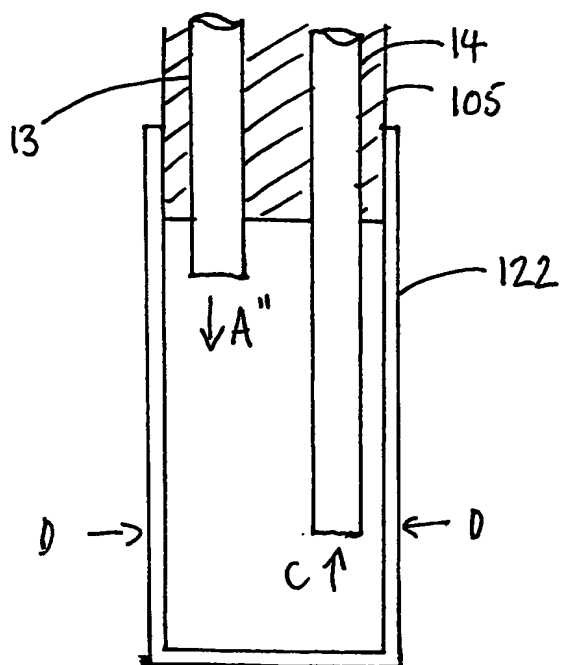
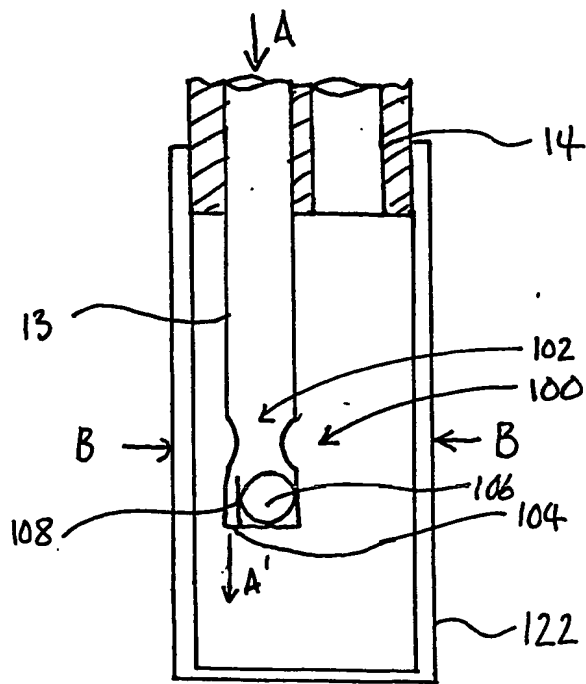
Fig 5

4"

6"

5"





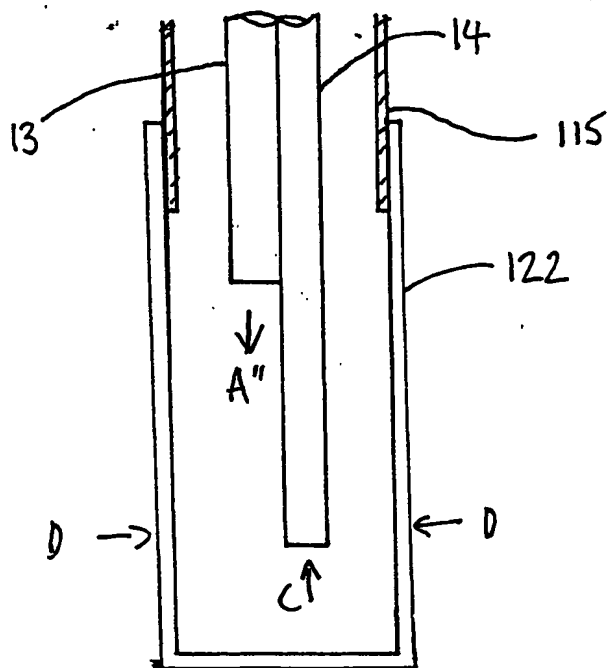


FIGURE 10

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